Government of Zimbabwe

Rural Agro-Industrial Development Centres

Tomato Processing Investment Brief

October 2022

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Investment Brief: Tomato processing

Investment Opportunity: Rural Agri Industrial Development Centres- Tomato processing plant

Investment Summary

Problem	Post-harvest loss of food crops, during or after harvest, is not only a loss of valuable food, but also of the inputs required to produce and distribute it. Reducing post-harvest losses helps create more sustainable and resilient food systems and reduces greenhouse gas emissions. Reduction of post-harvest loss optimizes agricultural productivity and increases the incomes of food producers and associated value-chain actors. The causes of post-harvest losses and the stages at which they occur are numerous and varied depending on the crop, supply chain, location, and a variety of other contexts. Damage or loss can occur during all postharvest stages – during aggregation, transportation, and storage. According to Mogge et al. (2020, unpublished), between 45 % and 55 % of tomato produced in Mutoko is lost along the supply chain before reaching the retailer. The magnitude of losses is estimated as 6% at harvesting, 12.5 % during grading and packaging, 8.5% during transportation, 7% during wholesaling, and 16.5% at the retail stage. We estimate that production for the tomato paste factory could reduce substantially the losses as the tomato would not go to the wholesale and retail stages.		
Solution	• **Model 1 - Decentralised packhouse:** This model would consist of placing a packhouse[1] in the production area. The facility would be placed in geographical areas producing large surpluses of fresh produce and with large numbers of smallholder farmers. The packhouse could then include several functions, including aggregation, off-grid cold room, grading, packing and refrigerated transportation. These would help reducing the losses that occur prior to the retail stage, which have been found to be large in the available literature. • **Model 2 - Centralised packhouse**: This model would consist of placing a packhouse/cooling unit near to a location where the produce is sold. Ideally, these would be situated in urban municipal markets which trade large volumes of horticultural products. The functions would be like those of the decentralised packhouse. The main difference with respect to the decentralised packhouse is that in this case the aim is to reduce primarily losses occurring at the wholesale and retail stages. • **Model 3 - Decentralised processing:** This model would consist of placing a decentralised facility that would process and add value to the horticultural produce in the production area. Here, rather than decreasing losses through improved logistics and providing services, the underlying idea is to convert a perishable product into a processed product or by-product that is no longer perishable, thereby reducing the losses that occur along the value chain.		
Investment Outlay	Private Sector	Pack house, processing plant and produce off taking	US$2.01million
	Public	Land, duties, and taxes rebates	US$0.04million
Product /Services	Procurement of produce, processing into tomato paste/puree, export		
Forecast initial market/demand	The urban population in Zimbabwe is 4,110,456 (Zimstats 2021), export to South Africa, Mozambique		
Scale	Aggregation centres only	Manicaland- Middle Sabi	

[1] Packhouses may do some or all the following: grade, pack and store produce according to market requirements. Packaging of horticultural produce is a crucial step in providing fresh and attractive products to the end consumers.

	Expansion areas- to serve these corridors	Chegutu and Chinhoyi, Gokwe-Kwekwe-Gweru, Mutoko-Murehwa-Domboshava, Mazowe-Bindura-Shamva, Nyanga-Mutasa
Profitability Indicators	**IRR 25%** **NPV US$404 892** **ROI 19% 5 year average** **PBP 3 years 1 month**	
Socio-Economic Impact	Smallholder Farmer Support	Number of farmers reached- 1 671 growing to 10 800 after scaling up
	Poverty Indicators	Small holder farmers are expected to commit 0.25ha of land to tomato production. The expected annual income per farmer is US$2 068 per annum up from an estimated US$1 250 for above average farmers.
		Horticulture crops complement incomes and are vital for nutritional benefits, thus any preserved produce add to income and food.
	Efficiency & Output Indicators	Production and productivity index: Food waste and loss reduced from between 45%-55% to 12%
		Market Access: Supply local fast food outlets and urban consumers.
Environmental Impact		
Enabling environment	Investment Approval and licencing	Government and local authorities to offer ease registry and licensing services.
		Investor to commence international certification process of the pack house and processing plant and cascade the process to farmers in preparation for exportation of produce to international markets.
	Fiscal Incentives	Duties and taxes rebates Tax holiday for an agreed period Dividend and capital repatriation modalities and funds escrowing to be put in place. This allows ease of funds movement from in-country to investor country of origin.
	Policy Incentives	Government to protect the investor by restricting imports (industry protective measures) of horticultural produce during production periods. Restrict imports during lean periods.
Interconnected Investments	Hybrid seed suppliers, cold chain, and cold room operations	

A. Introduction

The challenge of Food Loss and Waste is significant and recognised globally and in Africa. In September 2015 the United Nations announced a goal of halving worldwide food waste and substantially reducing global food loss by 2030 as part of its Sustainable Development Goals (SDG) agenda (SDG Target 12.3). African Union Member States went further, pledging to halve postharvest food loss by 2025 under the Malabo Declaration.

Post-harvest loss of food crops, during or after harvest, is not only a loss of valuable food, but also of the inputs required to produce and distribute it. Reducing PHL helps create more sustainable and resilient food systems and reduces greenhouse gas emissions. Reduction of PHL optimizes agricultural productivity and increases the incomes of food producers and associated value-chain actors.

The causes of post-harvest loss and the stages at which they occur are numerous and varied depending on the crop, supply chain, location, and a variety of other contexts. Damage or loss can occur during all postharvest stages – during aggregation, transportation, and storage.

Zimbabwe does not have a standalone food loss and waste policy. Reduction of food loss and waste is however addressed in several major policy documents. The Zimbabwe Food and Nutrition Policy (2012) commits to reducing food loss to below five percent. The National Agricultural Policy Framework (NAPF, 2018-2030) and Agriculture and Food Systems Transformation Strategy (AFSTS, 2020-2025) promote good post-harvest management practices, and public-private partnerships to improve roads, post-harvest storage and marketing infrastructure and facilities. The Horticulture Recovery and Growth Plan (2021) focuses on two broad and mutually reinforcing areas, namely: a private sector-driven recovery of the conventional horticulture sub-sector; and a robust, inclusive, and sustainable and transformative rural horticulture sub-sector. The plan includes research, development, and innovation in production, mainstreaming of indigenous vegetables and fruits, processing, value addition and beneficiation to develop both the domestic and export markets[2].

Average food loss and waste in Zimbabwe is estimated at 30 percent (Sadza et al., 2015). food loss and waste is higher in horticulture value chains because the produce is perishable. Figure 1 shows the main horticultural crops produced in Zimbabwe as listed in the 2020 Second Round Crop and Livestock Assessment Report. Cabbage and tomato are the main crops purchased locally with significant volumes of Irish potato, leafy vegetables, butternut, and banana.

[2] https://www.herald.co.zw/horticulture-recovery-plan-gets-huge-boost/

B. Context Analysis

Situation Analysis:

Origin of losses in tomato and banana

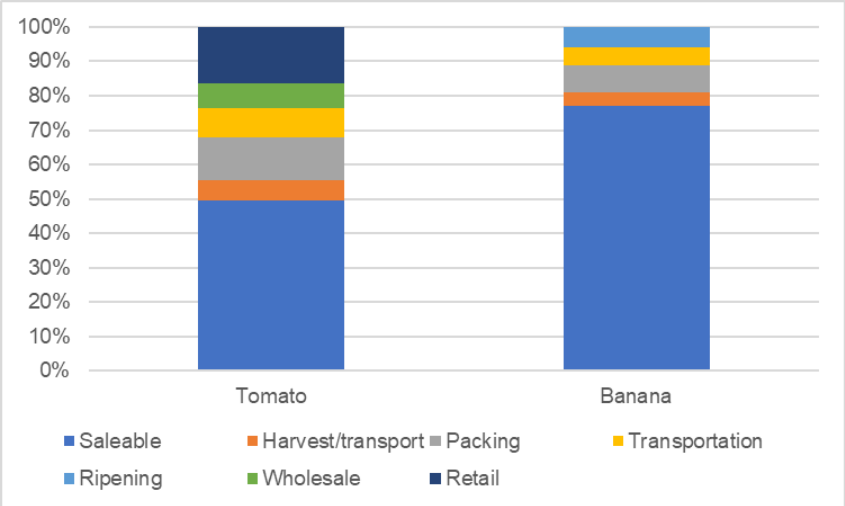

Figure 2. horticultural food loss and waste in the tomato and banana value chains (after Mogge et al. (2020) and Mvumi et al. (2020))

Horticultural Food Loss And Waste in Zimbabwean tomato and banana value chains are illustrated in Figure 2. According to Mogge et al. (2020, unpublished), between 45 % and 55 % of tomato produced in Mutoko is lost along the supply chain before reaching the retailer. The magnitude of losses is estimated as 6% at harvesting, 12.5 % during grading and packaging, 8.5% during transportation, 7% during wholesaling, and 16.5% at the retail stage[3].

Mvumi et al. (2020) report distribution of losses along the banana supply chain as:

- Transit to the packhouse (4%)
- Washing, grading and packing (1.3-8%). The problems include poor hygiene when washing/drying before selling resulting in infection and rots, lack of cold rooms and incorrect/absence of packaging materials.
- Transportation (4-5%)
- Ripening (2-6%).

These account for most of the 25-27% of losses in the value chain. Other losses are caused by inadequate banana bunch management and timing of harvesting, poor coordination between producers and consumers, inadequate communication and coordination between producers and processors.

It is noteworthy that for both value chains there is appreciable loss post-harvest and prior to the retail stage. Interventions aimed at reducing losses at these nodes would significantly reduce overall food loss and waste and potentially improve production systems. The foregoing food loss and waste values reflect informal production and marketing systems where there is a lack of infrastructure, especially logistics and cold chain management - food loss and waste in formal value chains are considerably lower. The approach taken in this work is to marry informal production systems with formal marketing and distribution solutions.

[3] Restriction movements imposed in response to COVID-19 increased tomato losses to as high as 75 %.

C. Model Description

Model description

- **Model 1 - Decentralised packhouse:** This model would consist of placing a packhouse[4] in the production area. The facility would be placed in geographical areas producing large surpluses of fresh produce and with large numbers of smallholder farmers. The packhouse could then include several functions, including aggregation, off-grid cold room, grading, packing and refrigerated transportation. These would help reducing the losses that occur prior to the retail stage, which have been found to be large in the available literature.
- **Model 2 - Centralised packhouse**: This model would consist of placing a packhouse/cooling unit near to a location where the produce is sold. Ideally, these would be situated in urban municipal markets which trade large volumes of horticultural products. The functions would be like those of the decentralised packhouse. The main difference with respect to the decentralised packhouse is that in this case the aim is to reduce primarily losses occurring at the wholesale and retail stages.
- **Model 3 - Decentralised processing:** This model would consist of placing a decentralised facility that would process and add value to the horticultural produce in the production area. Here, rather than decreasing losses through improved logistics and providing services, the underlying idea is to convert a perishable product into a processed product or by-product that is no longer perishable, thereby reducing the losses that occur along the value chain.

Decentralised packhouse

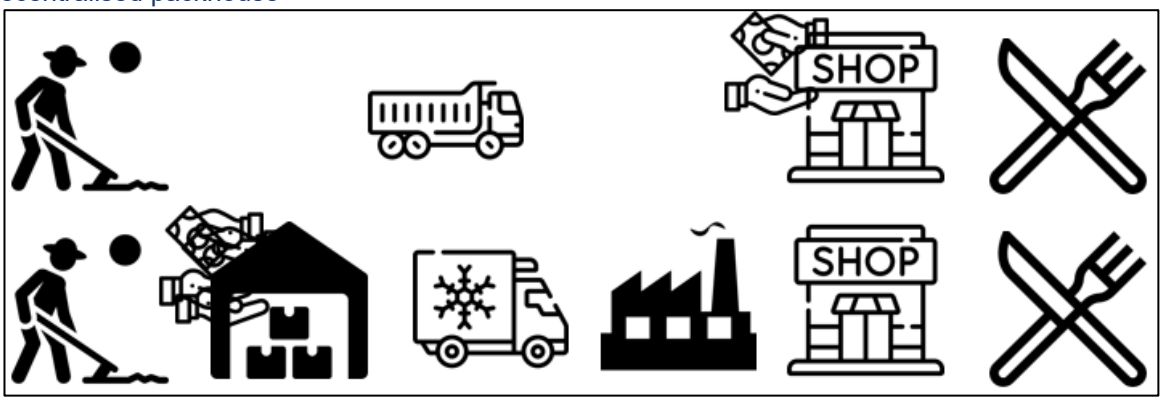

Figure 3. Comparison between the current marketing methods and the proposed decentralised packhouse model. Currently farmers grow and harvest the crop using sub-optimal practices. There is an absence of safe handling and cold chain prior to sale at the market. The decentralised packhouse model involves sale and transfer of risk to a nearby packhouse in the production area, with the potential availability of farmer services. Loss and waste are minimized along the value chain, increasing returns and viability.

Packhouse models involve the development of infrastructure which will facilitate procurement and optimal temporary storage of produce. The typical functions of packhouses help to address the root causes of horticultural food loss and waste losses at the different stages. By providing services including cold chain management, grading, sorting, packing and transportation, this model will address such bottlenecks and is thus particularly relevant for value chains where large losses occur before during the stages of transport, handling, storage before reaching the wholesale and retail markets.

[4] Packhouses may do some or all of the following: grade, pack and store produce according to market requirements. Packaging of horticultural produce is a crucial step in providing fresh and attractive products to the end consumers.

Centralised packhouse

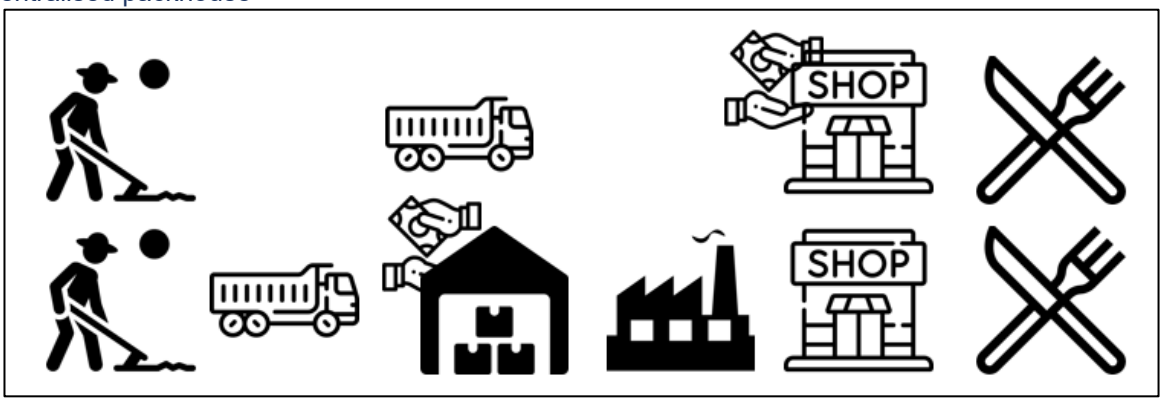

*Figure 4***.** Comparison between the current marketing methods and the proposed centralised packhouse model. Farmer marketing methods are described earlier. In this model the farmer delivers the produce to a formally operated packhouse there is safe storage and cold-chain management. Third grade produce is sold for processing, reducing loss, and increasing farmer incomes.

The difference between this model and the former one is the is the location of the packhouse – a centralised packhouse is in an urban area close to a farmer's market, such as Mbare (Harare), New Market (Bulawayo) or Sakubva (Mutare). Farmers typically arrive at these markets on open trucks sitting on their produce. On arrival traders flock to the vehicle to try and secure a deal for the produce. At the end of the process, farmers are often left with third grade produce for which there are few buyers, resulting in waste. While precise estimates of the breakdown of losses (by tomato grade and reason) at the retail stage are not available, the figure of 23% of losses at retail stage suggests that this is likely to be an important issue.

Production of tomatoes is second only to cabbages (Figure 1). The crop is traded in large volumes in the informal markets and is an important income source for many farmers. The model targets losses at the wholesale and retail stage which as we saw earlier can be as much as 23% for tomatoes (Mogge *et al*., 2020).

Decentralised processing

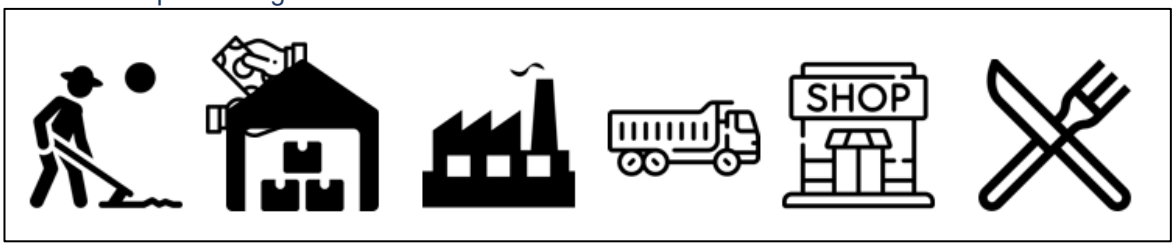

Figure 5. The decentralised processing model. The anchor firm contracts out-growers, providing them with extension and other services. Productivity and quality are high and good harvesting and transport practices ensures little damage is done to the commodity. Produce is processed on site and transported after it is no longer vulnerable to loss and waste.

There are a wide range of possibilities when it comes to the processing of horticultural produce including drying (sun, heat, and freeze), juicing, canning, pasting/concentrating, freezing and flour manufacture. Although processing facilities are mainly found in urban areas, rural centres would provide greater benefit to producers through minimizing post-harvest loss.

The proposed decentralised processing model illustrated in Figure 5 involves placement of a processing plant within an existing or at a potential production area. Farmers deliver produce over a short distance minimizing losses associated with storage and transport.

D. Forecast Market/Demand Narrative

Forecast Market Value US$					
Estimated sales	Year 1	Year 2	Year 3	Year 4	Year 5
US$	4,320,000	5,184,000	6,220,800	7,464,960	8,957,952

Forecast market volume (units)							
Crop	**Tomato**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Total**
Purchases (kg)		9,000,000	10,800,000	12,960,000	15,552,000	18,662,400	66,974,400
Buying price US$		0.11	0.11	0.11	0.11	0.11	
Processed quantity		3,600,000	4,320,000	5,184,000	6,220,800	7,464,960	
Cost of produce US$		990,000	1,188,000	1,425,600	1,710,720	2,052,864	7,367,184
Production costs factor	2.59	2,567,664	3,081,197	3,697,436	4,436,923	5,324,308	
Cost of sales		3,557,664	4,269,197	5,123,036	6,147,643	7,377,172	
Gross margin		18%	18%	18%	18%	18%	
Internal costs US$		216,000	259,200	311,040	373,248	447,898	1,607,386
Total costs		3,773,664	4,528,397	5,434,076	6,520,891	7,825,070	28,082,098
Selling price US$		0.98	0.98	0.98	0.98	0.98	
Monthly purchases	314,472						
Total sales		4,320,000	5,184,000	6,220,800	7,464,960	8,957,952	32,147,712
Internal costs %	5%						
Buying price US$/kg	0.11						
Selling price US$/kg	1.2						
Processed %	40%						
Annual growth rate	120%						

Feasibility confidence level		
	Yes/No	Rationale for your response
A technical perspective	Yes	There is adequate front-end work that has been done to test the model. There are other players to learn from
A supply perspective	Yes	There are farmers who are currently producing although there is need to change the varieties to processing varieties
A demand perspective	Yes	There is a sizeable gap to support the project especially on the export side

	A legal/ regulatory perspective	Yes	Government supporting of the project and is expected to enact enabling policies
	A farmer value perspective	Yes	It reduces post-harvest losses and increases revenue to the farmers
	An economic perspective	Yes	Preserves the value of produce and improves income security of producers. Value of agricultural produce shall increase.

E. Estimated impact

Economic Impact					
Financial forecast	Year 1	Year 2	Year 3	Year 4	Year 5
Purchases from farmers Units (kgs)	9,000,000	10,800,000	12,960,000	15,552,000	18,662,400
Production units (kgs)	3,600,000	4,320,000	5,184,000	6,220,800	7,464,960
Forecast revenue US$	4,320,000	5,184,000	6,220,800	7,464,960	8,957,952
Forecast costs US$	3,773,664	4,528,397	5,434,076	6,520,891	7,825,070
Forecast. profit (EBITDA) US$	546,336	655,603	786,724	944,069	1,132,882
Key assumptions					
Ave. Profit margin 18%, Unit sales to increase 20% annually Processing output is 40% of throughput Plant capacity of 20million kgs per annum					

Social Impact					
Estimated # of beneficiary small holder farmers (cumulative)	806	967	1, 161	1,394	1,671
Reduction of post-harvest losses (%) rom 50.5% for fresh market	12%	12%	12%	12%	12%
Increase in annual income per farmer from US$1 250 to US$ 2 068 (per farmer)	838	838	838	838	838

F. Resource requirements and estimated return

Investment requirements			
Description	Cost	Time period	Comments
Building, processing plant Machinery, commercial vehicles Support infrastructure (water, electricity et al) Other costs (vehicles, management et al)	US$1.1m		All establishment costs

	Working capital	US$0.94m		Procurement of produce from farmers for the first three months

	Contribution from government			
	Land	US$0.01m		For project sites country wide
	Waive duties and tax	US$0.025m		Duties on importation of project vehicles and machinery/equipment
	Total value of government's contribution US$	**US$0.035m**		

F.1 Financial return

Financial return

Aggregation model

Tomato processing financial returns

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Initial Investment	(2,012,416)					
Income		4,320,000	5,184,000	6,220,800	7,464,960	8,957,952
Outflow	2,012,416	3,773,664	4,528,397	5,434,076	6,520,891	7,825,070
Net cashflow	(2,012,416)	546,336	655,603	786,724	944,069	1,132,882
Discount rate	7%					
NPV US$	404,892					
Payback period	3years 1 month					
IRR	25%					
ROI		27%	17%	17%	17%	17%

G. Key risks and mitigating factors

	Key risks and mitigating actions				
	#	Description of risk	Potential impact (L, M, H)	Probability (L, M, H)	Mitigation strategies
	Internal business risks				
	1	Lack of electricity	H	H	Solar powered infrastructure
	2	Lack of the processing tomato produce	M	M	Government through the Ministry of Agriculture to offer extension services
	3	Demand might be overstated	H	L	Perform a more in-depth market analysis
	Health, safety, and environmental risks				

	1	High waste producing system might affect environment	H	M	The waste could be used for other products like stockfeed, organic manure.
	2	Road network might not be favourable	M	M	State to assist in ensuring that the state of repair of roads is good
	Market, regulatory and competitive risks				
	1	The small size of the processing plant might result in takeover by bigger players	H	L	Government to offer market protection.
	2	Cost management could be a challenge	H	M	Investor to offer technical and management support
	Social and political risks				
	1	Economic and political environment in Zimbabwe might present challenges to external investors	H	M	Local skills to assist investor navigate the environment